Forty Lessons in Physics. By LYNN B. MCMULLEN. New York: Henry Holt & Co., 1906. Pp. xviii+752.

McMullen's *Forty Lessons in Physics* is a neat-appearing book, which breaks away from the stereotype form so common of late years. It has an individuality which is pleasing, even though it may not be considered serviceable. It follows consistently certain lines of presentation throughout, and attempts but one thing: a concise statement of the essentials by means of definitions, synopses, diagrams, formulas, and problems, without experiments, pictures, illustrative discussions, or an appendix. And it is also remarkably free from the errors and ambiguities which ordinarily attend a first edition.

This brief review will disclose to most teachers of physics either strength or weakness, depending largely upon their own views of what is desirable. What one considers strength another will consider weakness, as there is a wide difference of opinion as to what is desirable in a textbook. And also, strange as it may seem, what many consider weakness theoretically they will accept as strength when it comes to practical applications; as many teachers utterly fail to practice in their teaching what they preach at teachers' meetings.

The book is pedagogically strong, in so far as it approaches gradually some of the more difficult subjects. As the human race requires generations, and the infant requires years, to assimilate new ideas, so the high-school pupil requires weeks, and sometimes months, to understand the more difficult subjects of physics. No matter how well grounded the average pupil may be, no matter how diligently he may study, the difficult subjects cannot be grasped at once. Time is as essential an element as knowledge and diligence. The book presents such subjects as force and energy first qualitatively and then later quantitatively. This is as it should be with all difficult subjects; and it is frequently well to make both the qualitative and the quantitative presentations in widely separated steps. But in the *Forty Lessons* this method seems to be accidental rather than intentional; and the principle is woefully violated in many cases.

The pedagogical weakness of the book is indicated by the word "definitions" above. The text seems to be little else than a series of dependable definitions. This word may be an unkind exaggeration; but in my opinion the meaning which the book seeks to convey is couched in such concise terms as to be unintelligible to the average high-school pupil. Unfortunately this is true of many of our physics textbooks; and in discussing the matter I do not by any means criticize this book alone. I think to the average teacher of physics this text is sufficiently clear—clearer than many others. But we should bear in mind that the teacher in physics has a basis for comprehending away beyond the average pupil, not only in his knowledge of the subject itself, and in his ability to infer all that the words and phrases imply, but also in his far wider life-experiences. If it were Latin or even mathematics, the life-experiences would count for little; but not so with physics. If the book is desired merely as a concise summation of what has been elaborated in the laboratory and the classroom, it would well answer the purpose. But to me a textbook is of value only in so far as it conveys meaning to the average pupil after a consideration of such preliminary experiments as the subject may allow. If the teacher is obliged to illustrate and explain by mere words, the textbook is superfluous; reference books in the library will suffice. And verbal explanations are undesirable because they consume valuable time and add

to the mental exhaustion of the pupils due to constant "teachers' talks." It also develops the shiftless ear-habit which is so common. Most men and women will ride several miles, and spend an hour or so in a poorly ventilated and crowded room listening to a lecture, rather than to read quietly at home articles on the same subject written by better authorities, in more careful language; and this although the lecture must be gulped down whole as it comes, while at home one may select or reject, read or meditate, at pleasure. This is because most persons have acquired the ear-habit which teachers force upon pupils by their constant talks. If authors and publishers want books appreciated, they will do well to present to pupils those which are intelligible to them as well as to the teachers.

In the *Forty Lessons* almost the first reference to the dyne is the statement that it is "that force which, acting against the inertia of a one-gram mass for one second, produces a change in velocity of one centimeter per second." No explanation whatever follows, and nothing more intelligible precedes. I have not taught the dyne for years because the majority of my pupils cannot understand it, and the time is better spent otherwise; so that I would eliminate it altogether from the textbook. But if it enters let it come clothed in language that is intelligible to at least the inexperienced teacher. As the conditions referred to cannot be produced and have never existed, how is the helpless pupil to know all of the implications which are expected to arise out of that which is not stated? This and similar definitions are followed by a set of problems which are never worked intelligently by the average pupil, but are solved mechanically by means of formulas. Their nature is indicated by the phrase "acceleration per second per second" which is used occasionally; a phrase which is hardly understood by the average teacher.

Later the book states: "The specific heat of any substance is the ratio of the amount of heat required to raise unit mass of that substance one degree to the amount required to raise unit mass of water one degree." This is neither preceded nor followed by explanations. How eagerly many pupils seek for some crumb of meaning when confronted by such definitions! What teacher cannot call up the weary, earnest face of some pupil as she relates how she struggled trying to understand similar statements or the problems based upon them; and how appreciative she became when a few well-put phrases made the meaning clear. Why not say: "The specific heat of iron is the number of calories required to raise the temperature of one gram of the iron one degree," or something similar, and then follow it up with some broadening explanation? The word "ratio" has little meaning to those not raised on ratios; the phrase "amount of heat" is first mentioned eight lines above the definition; "mass" is understood only by Karl Pearson; and the introduction of water doubles the confusion. The first problem based on this definition is the following: "How much tin at 90° C. must be placed in 100 g. of mercury at 10° C. contained in a glass vessel whose mass is 50 g. so that the resulting temperature may be 20°?" The problem is ambiguous even to the calorimetry expert; and certainly should not be thrust upon the pupil without breaking the way by something more simple and practical.

Throughout the book appears this same scientific preciseness which excludes clearness. And this is aggravated by attempting to convey conceptions of unfamiliar objects with line diagrams.

I believe that there is nothing so destructive to high-school physics as these unintelligible presentations; and I base my opinion upon investigations along this line covering many years and thousands of pupils. It cannot be said that the teacher

should make up the deficiencies. No teacher should be obliged to use the class time for this purpose; and most teachers, though they may be forced to explain finally, will assign from the book first, thus rapidly destroying the enthusiasm of the weaker pupils. And, above all, the pupil who is forced to purchase a textbook has a right to receive that which is of value, and not that which merely deadens his interest and stultifies his intellect.

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Elements of Political Science. By STEPHEN LEACOCK. Boston: Houghton, Mifflin & Co., 1906. Pp. ix+417. $1.75.

It is not the aim of this book to throw new light upon the solution of political problems. It will be welcomed, however, by students and teachers of political science because it furnishes a careful analysis of the material already on hand, and a brief, but clear and comprehensive, statement of the most important conclusions reached by investigators in this field.

In defining its scope the writer says: "Political science deals with government. . . . . Its field lies in the examination and analysis of the varying forms of human organization in which the element of social control is embodied." But "the organized aspect of the community, the state, must be treated not only as an actuality, but also as a product of the past, and as the basis of the life of the future." Having thus defined its scope, he proceeds to trace its relations to the other sciences. Its conclusions, of course, are based upon the facts of history. "There is, indeed, a natural tendency on the part of the political scientist to view history somewhat in the light of mere raw material." Its principles are also closely interwoven with the principles of political economy; while it embraces completely the fields covered by international and constitutional law.

The whole field of political science is divided into three parts. Part I deals with the nature of the state. Here are considered the various theories regarding the origin of the state, the question of sovereignty, the subject of rights, the relation of states to one another, and the classification of states based on their forms of government. In Part II the structure of government is examined. To the usual discussion of the separation of powers and commentaries on the legislative, executive, and judicial departments of government are added very interesting chapters on federal government, colonial government, local government, and party government. Under the general head of "The Province of Government," in Part III, the author criticizes briefly the theories of individualism and socialism, and shows in conclusion that the modern state has tendencies toward the latter. He points to modern protective tariffs; to attempts on the part of the state to regulate prices and control corporations; to governmental interference in behalf of the working-class in the way of factory laws, state insurance, and pension laws; and to a constantly increasing municipal control of public utilities as evidence of how far society has departed from the individualistic *laissez-faire* doctrine that held sway about a century ago.

Some will be inclined to differ with the writer's view as to the vesting of sovereignty, and the followers of Hamilton will hardly agree that the doctrine of implied powers necessarily means a stretching of our constitution. The paragraphs on the control of railroads by government will seem to many to give undue prominence to the argu-